Small Business Innovation Research/Small Business Tech Transfer

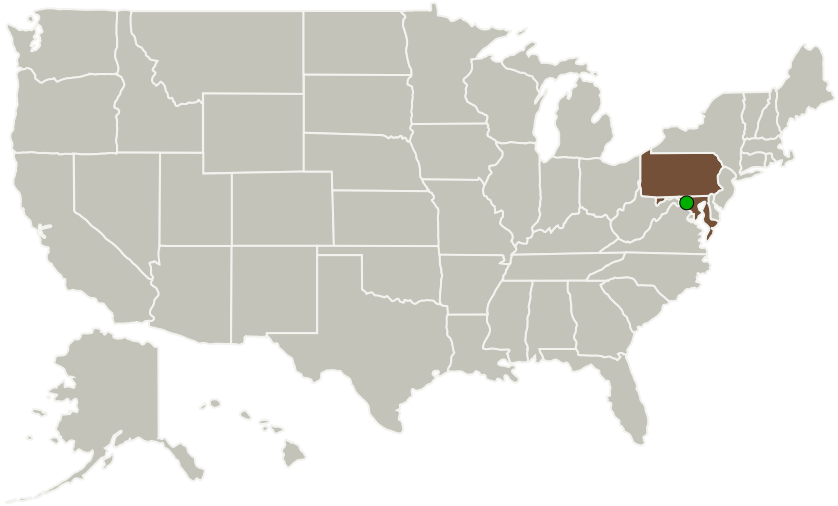
Dynamically Reconfigurable Electrical Power System(EPS) with Integrated Thermal Management and High Voltage capability for Small Spacecraft, Phase I

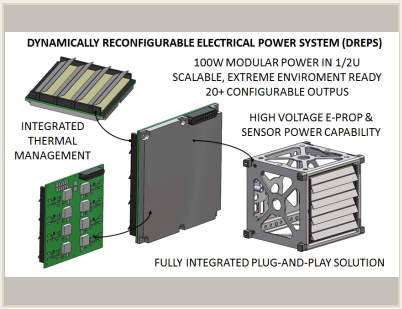
Completed Technology Project (2017 - 2017)

Project Introduction

The proposed electrical power system (EPS) aims to improve modularity, scalability, and efficiency of small spacecraft and CubeSat power systems (up to 100W) by implementing a novel dynamically reconfigurable converter architecture that integrates high reliability components and novel thermal management techniques to enable safe operation in extreme radiation and temperature environments. The new Dynamically Reconfigurable Electrical Power System (DREPS) fully featured small-satellite power system modular architecture incorporates a number of new technologies enabling a solution that is capable of input and output power levels up to 100W in a 0.5U CubeSat form factor. Integration of state-of-the-art technologies such as Wide Bandgap MOSFETs, heat pipes, printed circuit board (PCB) integrated planar magnetics, digital system control and three-dimensional circuit layout techniques will aid in the ability to deliver an unparalleled level of system control while providing a solution focused on extreme environmental conditions needed for long duration space missions. The new approach also provides solution for proposed new electric propulsion technologies via recent advances in high voltage ceramic-based power converter technology. Integration of cutting edge thermal management technology will enable adaptive retention or rejection of heat as a fully integral portion of the system packaging. Additionally, an array of configurable Maximum Power Point Tracking (MPPT) Battery Control Regulators (BCR) will allow compatibility with all available industry standard solar cells and energy storage technologies.

Primary U.S. Work Locations and Key Partners





Dynamically Reconfigurable Electrical Power System(EPS) with Integrated Thermal Management and High Voltage capability for Small Spacecraft, Phase I Briefing Chart Image

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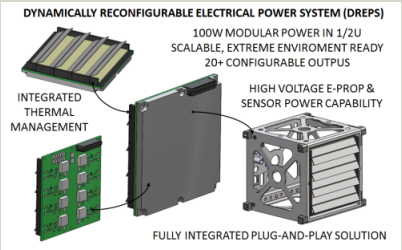
Organizations Performing Work	Role	Type	Location
QorTek Inc	Lead Organization	Industry Small Disadvantaged Business (SDB)	Williamsport, Pennsylvania
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Pennsylvania

Images



Briefing Chart Image
Dynamically Reconfigurable Electrical Power System(EPS) with Integrated Thermal Management and High Voltage capability for Small Spacecraft, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/131868)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
QorTek Inc

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

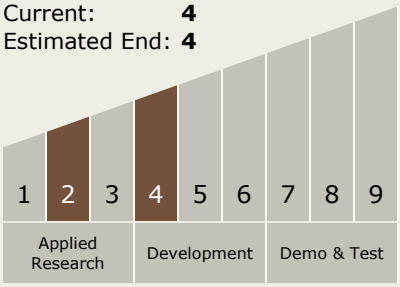
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Gareth J Knowles

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.1 Management and Control